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Notes on the Genus *Hygrolembidium* (Hepaticae)¹

JOHN J. ENGEL

DONALD RICHARDS ASSISTANT CURATOR OF BRYOLOGY
FIELD MUSEUM OF NATURAL HISTORY

Study of several large collections of Hepaticae from southern South America has revealed perianth- and sporophyte-bearing plants, both of which are heretofore unknown for the species. With these structures at hand, the relationships and taxonomic position of this taxon may be assessed with greater certainty.

Hygrolembidium isophyllum Schust. Nova Hedwigia 15: 467. pl. 56. 1968.

Holotype.—Argentina, Tierra del Fuego, Paso Garibaldi, near Lago Escondido, Schuster 58319e (RMS!).

Schuster (1968) described *Hygrolembidium isophyllum* from Tierra del Fuego, but at the same time reflected his uncertainty regarding the systematic position of this taxon when he stated (p. 467), "Allied to *Isolembidium* and possibly also to *Hygrolembidium* is another undescribed taxon which serves, in some ways, to connect *Hygrolembidium* and *Isolembidium*, yet differs from both taxa." Schuster (*loc. cit.*) emphasized the uniqueness of the species when he described for it a monotypic subgenus (subg. *Hygrobellopsis*). Through the study of several collections of *H. isophyllum*, especially sporophyte-bearing material, the relationships of the taxon may be assessed with greater certainty. In

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addition, the study of these collections has provided useful information regarding the ecology and phytogeography of the species.

Schuster (1968) stated the leaves of *H. isophyllum* were unistratose, and utilized this character in differentiating it from *Isolembidium* and the remainder of *Hygrolembidium* taxa. I have found the leaves of *H. isophyllum* to be 2-3 stratose in the median basal portion, with marginal areas unistratose. The leaves, however, may have polystratose regions scattered among areas of a single cell layer. The possession of at least locally polystratose leaves aids in establishing the rather close relationship of this taxon to both *Hygrolembidium* and *Isolembidium*.

The margins and apices of leaf and underleaf of *Hygrolembidium isophyllum* have several (8-20) slime papillae. The papillae are usually mounted directly on the margin but may be on the tip of a 1-several-celled tooth. There is no mention of slime papillae or teeth in the original description or indication of their presence in the figures of the taxon in Schuster (1968). I have, through the kindness of Dr. R.M. Schuster, studied holotype material of *Hygrolembidium isophyllum* and confirmed the presence of these structures in the original material. Neither *Isolembidium* nor the remainder of *Hygrolembidium* taxa possess slime papillae, and the presence of this character in *H. isophyllum* aids in the distinction of subgenus *Hygrobellopsis*. The perianth mouth, bract, and bracteole margins and apices are likewise ornamented with slime papillae. The perianth mouth and bracts of *Hygrolembidium andinum* Herz. may have slime papillae, judging from the general appearance of the structures figured, but not described, in Herzog (1954, fig. 8e, h), but the leaves are entire and without slime papillae. I have not seen the type material of this taxon.

Hygrolembidium isophyllum was described on the basis of completely sterile material. Study of fertile material of this species has shown the perianths of *H. isophyllum* and those of the remainder of *Hygrolembidium* taxa compare somewhat in general shape, i.e., trigonous, fusiform to elongate-ovate, and contracted toward the mouth. *Hygrolembidium isophyllum* however, is pluriplicate in the upper one-half.

Hygrolembidium isophyllum, like the other members of the genus, possesses a *Lepidozia*-type seta anatomy [8-16 (-20) rows of large epidermal cells surrounding an indefinite number of interior rows of cells]. While *Hygrolembidium isodictyon* has 17 rows of epidermal cells and *H. stereophyllum* 16 rows (*fide*

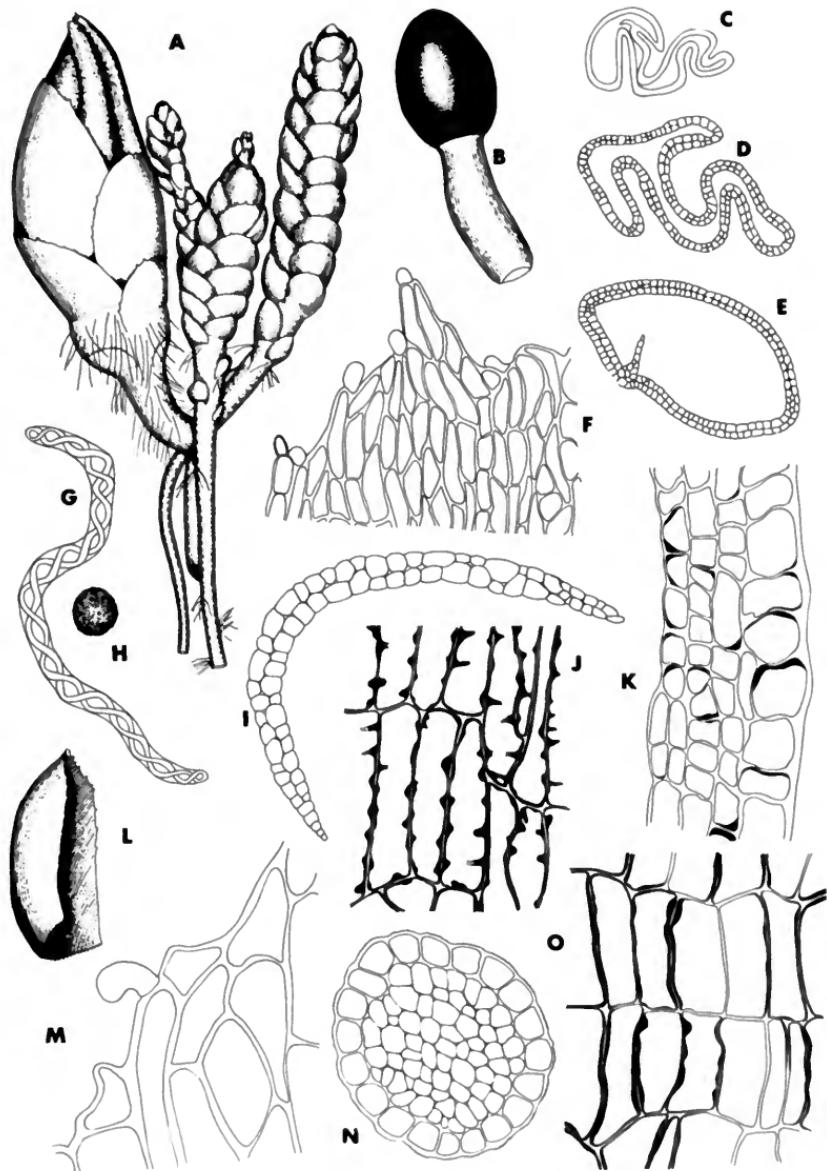


FIG. 1. *Hygrolembidium isophyllum* Schust. A, portion of plant with perianth, $\times 20$; B, capsule with portion of seta, $\times 20$; C-E, perianth, cross-sections at ca. one-fourth distance from apex, middle, and base respectively, $\times 37$; F, perianth mouth showing 5 slime papillae, $\times 175$; G, elater, $\times 450$; H, spore $\times 450$; I, innermost bract, cross-section through base, $\times 90$; J, inner cells of capsule wall, $\times 450$; K, capsule wall, cross-section, $\times 450$; L, bract of innermost series, lateral view, $\times 20$; M, bract apex of innermost series showing a slime papilla, $\times 450$; N, seta, cross-section, $\times 90$; O, outer cells of capsule wall, $\times 450$. Figure A from Hatcher 15-13, Chile, Prov. Magallanes, Puerto Natales. Figure B-O from Engel 1982, Chile, Prov. Magallanes, Brunswick Peninsula, 8 km. W of Punta Arenas.

Herzog, 1951, figs. 7, 9, respectively), *H. isophyllum* has 18-20 rows. The capsule wall anatomy of *H. isophyllum* differs somewhat from *H. stereophyllum*, to my knowledge the only other member of the genus known with sporophytes. *Hygrolembidium isophyllum* has 4-6 stratose capsule walls while *H. stereophyllum* has bistratose walls (*fide* Herzog, 1951).

Hygrolembidium isophyllum shares several critical features with *Hygrolembidium* and *Isolembidium* and indeed may be said to "connect" the two taxa. *Hygrolembidium isophyllum* has the isophylly and polystratose, deeply concave leaves of *Isolembidium* but differs in *a*) stem cells thin-walled throughout, without a hyaloderm but with a cortex of small cells, *b*) leaf margins with slime papillae, *c*) cells thin to uniformly thickened, and with trigones absent, and *d*) the exclusively intercalary branching. Like subgenus *Hygrolembidium*, subgenus *Hygrobellopsis* has polystratose leaves, exclusively intercalary branching, and a *Lepidozia*-type seta anatomy, but the latter differs in *a*) the small-celled cortex with an absence of a hyaloderm, *b*) the perfect isophylly, *c*) the presence of slime papillae on the leaves, *d*) the pluriplicate (upper one-half) perianth, and *e*) the 4-6 stratose capsule walls.

In working with collections from southern South America, I have previously recognized *Hygrobellopsis* as a distinct genus. I now believe, however, the differences outlined above are not sufficient generic criteria, but rather serve to emphasize that a distinct subgenus is at hand.

On the basis of fertile material examined, I am providing below a detailed description of the gynoecium and sporophyte of *Hygrolembidium isophyllum*.

Plants dioicous; androecia not seen. Gynoecia on short intercalary branches; bracts and bracteoles in 3 series, bracts of innermost series 2 cell layers thick in basal region, marginal 2-6 rows unistratose, deeply concave to subnaviculariform, ovate, margins and especially apices with slime papillae; bracteoles concave, not nearly as concave as bracts, broadly ovate, apices broadly rounded, margins and apices with slime papillae. Perianth with basal portion 2 cell layers thick, 3 layers thick only very locally, median portion mostly unistratose, but with scattered regions of 2 cell layers, upper one-third unistratose throughout, one-fourth to one-half emergent, fusiform to wide ovate, obscurely to distinctly trigonous in lower one-half, keels, when present, \pm rounded, not sharp, upper one-half pluriplicate, perianth contracted toward the mouth, the mouth with several small lobes, with slime papillae, subapical perianth cells irregularly rectangular, 52-77 μ long, 20-26 μ wide.

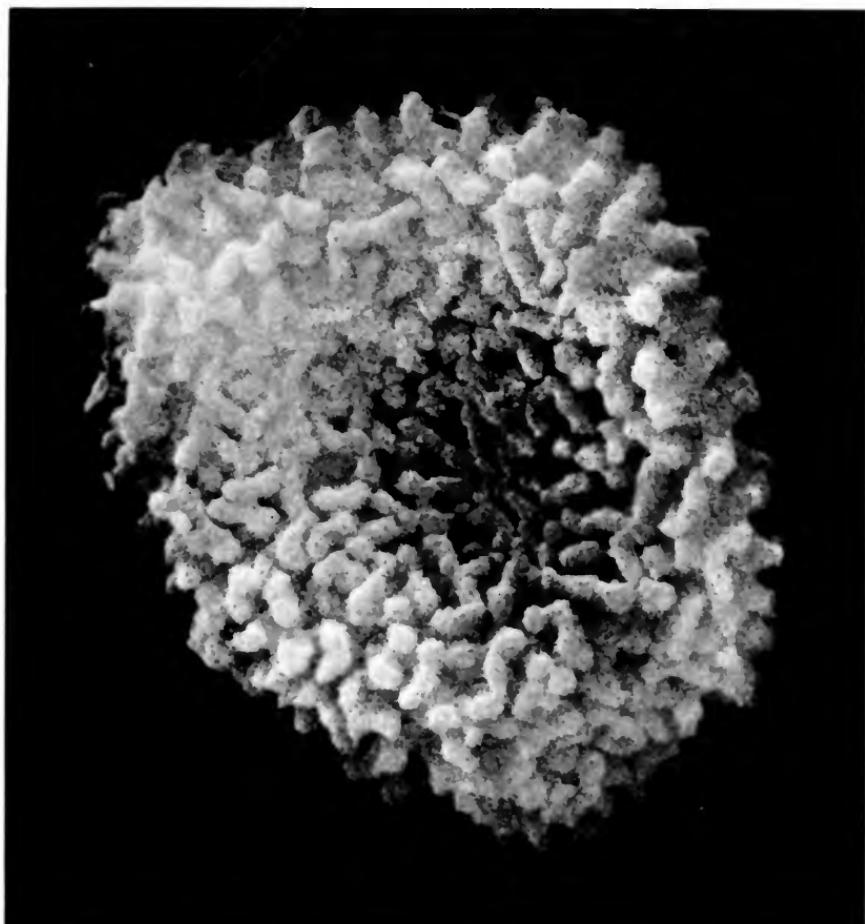


FIG. 2. *Hygrolembidium isophyllum* Schust. Scanning electron photograph of spore, $\times 5,700$.

Seta of the *Lepidozia* type, 10 cells in diameter, with 18-20 epidermal cells (52-62 μ in diameter) in very regular longitudinal rows surrounding an inner core of an indefinite number of cells (26-) 33-48 μ in diameter, corners slightly thickened. Capsule broadly ovate, 1.1 mm. long, 0.9 mm. wide, capsule wall 52-59 μ thick, of 4-6 layers, outer row of large cells and the inner 3-5 rows of smaller cells of approximately equal size, outer row of cells regularly to irregularly rectangular or subsquarrose in shape, 39-60 μ long, 13-26 μ wide, 18-26 μ thick, outer layer with radial walls with small to quite large red-brown nodular thickenings which have been interconnected by sheetlike thickenings, the thickenings strictly I-shaped or feebly extending onto outer tangential wall, radial walls occasionally thin walled and without thickenings; intermediate cell layers with or without radial thickenings, thickenings occasionally extending slightly onto outer tangential walls; inner

layer of cells irregularly rectangular in shape, 55-79 μ long, 10-22 μ wide, 7-12 μ thick, inner wall with usually incomplete semiannular bands or with nodular extensions of various lengths from sparingly developed swellings on the radial walls, rarely with complete semiannular band, swellings often without bands or extensions, radial walls occasionally without thickenings. Spores 17-21 μ , red brown, globose or broadly ovate in shape, covered with numerous vermiculate, short to long, closely arranged, irregular, occasionally branched ridges. Elaters usually long and slender, 126-169 μ long, 8-12 μ wide, occasionally shorter and stouter and to 17 μ wide, gradually tapering at both ends, usually bisprial throughout, occasionally 3 or 4 spiraled in median portion and bisprialized only at tips, spirals yellow brown.

Ecology-Phytogeography.—In the Falkland Islands this species seems to be restricted to sheltered cliffs above 610 m., where it grows on soil under rock overhangs or on *Azorella* cushions. In the Brunswick Peninsula (Chile, Strait of Magellan) I found the species only in the relatively dry eastern end (8 km. west of Punta Arenas, 305-610 m.), and here it grew on soil among cushion plants. Raymond E. Hatcher made several collections of the taxon in bogs between Punta Arenas and Puerto Natales, ca. 100 km. north of the Strait of Magellan, a locality which is on the eastern side of the Andes and thus relatively dry. The species is otherwise known only from between 420 and 790 m. on Isla Grande de Tierra del Fuego. On the mainland this taxon seems to be restricted to deciduous *Nothofagus* forests of magellanian South America.

Specimens seen.—FALKLAND ISLANDS. EAST FALKLANDS. MT. USBORNE REGION: ridge between Mt. Usbornes 1 & 2, 685 m., Engel 2522, 2556 (MSC). WEST FALKLANDS. PORT HOWARD: pass southwest of Mt. Maria summit, c. 610 m., Engel 3102 (MSC); MT. ADAM: east side of summit ridge, 670-700 m., Engel 3008 (MSC). ARGENTINA. TIERRA DEL FUEGO: east side of Paso Garibaldi, Sierra Lucas Bridges ($54^{\circ} 42' S.$, $67^{\circ} 45' W.$), 790 m., Crow 1711 (MSC); Paso Garibaldi, Cerro Gabriela ($54^{\circ} 39' S.$, $67^{\circ} 55' W.$), 580 m., Roivainen 685-c. per. (H); Paso Garibaldi, at $54^{\circ} 40' S.$, $67^{\circ} 55' W.$, 420 m., Roivainen 685 b (H); west side of Paso Garibaldi, Sierra Alvear, 460 m., Crow 1443 (MSC); north slope of mountain to east of Monte Olivia, Sierra de Sorondo, 670 m., Crow 1828 (MSC). CHILE. MAGALLANES: ridge above refugio (Club Andino), 8 km. west of Punta Arenas, 305-610 m., Engel 1982 — c. per. + sporo. (MSC); near road between Punta Arenas and Puerto Natales, ca. 100 km. north of the Strait of Magellan, Hatcher 14-6, 15-13—c. per., 17-15 (UW-M).

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